ESO 2327

MARKET EFFICIENCY AND EFFECTIVE PRICING

Carl Zulauf, Agricultural Economist, Ohio State University

Presented at Annual Meetings of American Agricultural Economics Association,
July 1996

MARKET EFFICIENCY

- DEFINITION: An efficient market is a market which incorporates all currently available information when determining price (the classic article is by Fama, 1970; it has been updated in 1991).

  - The efficient market theory conceptualizes markets as information. Since information about supply and demand changes, price will change. It is therefore reasonable to predict that today's price will not be tomorrow's price, even though on average it equals tomorrow's price.

  - Given this framework, to earn a profit it is not enough to know that price will change, the direction in which price will change must be known. The direction of price change depends on how information about supply and demand changes. Thus, profit is earned by people or companies who acquire information relevant to the market before anyone else in the market. NOTE: this argument underscores the importance of outlook information and analysis.

  - Information *per se* is not useful without analysis that places it in the context of existing information. Therefore, another method for earning profit is to analyze existing information better than the collective ability of the market (participants). NOTE: trading on analysis means trading against the collective analytical ability of the market. The 1995/96 marketing year is a good example of the payoff to "good" analysis.

    ⇒ neither speculators nor hedgers can profit from routine buying or selling.

    ⇒ current futures prices are unbiased estimates of subsequent futures prices; for example, planting-time price quoted for new-crop harvest futures on average equals the price received at harvest (see Tables 1 and 2). NOTE I: trading futures (forward) contracts cost at least 1.5-2 cents/bushel in the grains depending on the contract traded– costs include brokerage fees and liquidity costs (Brorsen and Nielsen, and Thompson and Waller). NOTE II: unbiasedness differs from probability of price change (see figure after Table 2).

    ⇒ Few people/companies consistently earn large profits from pricing decisions, and these people/firms earn their profits from their information and/or analysis (See Table from

Hartzmark, who analyzed CFTC's report on position of traders data for nine markets over the period 1977-1981).

USING EFFICIENT MARKETS FOR MARKETING

- CONTROLLING RISK. Futures and forward contracts can be used to control price and cash flow risk. For example, standard deviation of the December corn futures quote on May 1 was 38 cents per bushel over the period 1974-1995. Standard deviation of the December futures quote on December 1 was 54.8 cents per bushel. The difference is statistically significant, and suggests selling next year's crop at planting can reduce year-to-year price variation. This situation also exists for soybeans. NOTE: this discussion does not include an important consideration – yield variability.

- INFORMATION SOURCE. Because futures, options, and cash markets are markets in information, they should be used as a source of information. I provide three illustration. (1) Futures prices can be used by producers to guide production decision (for a review of the profit margin hedging literature see Johnson *et al.*). (2) Given the option pricing model developed by Black (adopted from Black and Scholes), as well as its offspring models, option prices can be used to derive the market's assessment of price volatility. (3) As first argued by Working, the cash-futures basis can be used to determine when to store provided storage was accompanied with a futures hedge. (see figure 4). Note: the storage basis has limited ability to predict returns to unhedged storage (see figure 3).

- MARKET ANOMALIES. Within the literature on stock prices, there is agreement among many professionals and academic that certain anomalies exist. These include, among others, the firm size, the January effect, day-of-the week effect, and the value-line effect. (For a more complete listing, see Gallinger and Poe). I would be surprised if some anomalies do not exist in agricultural futures markets; however, as of this time the evidence does not convince me that any such anomalies exist. While I would not classify this as an anomaly because we do not have a satisfactory understanding of technical trading, work by Lukac *et al.* and Lukac and Brorsen find that several technical trading systems earned significant risk-adjusted profits above transaction costs. However, it appears that to earn consistent returns, you must be using technical trading in a portfolio of markets, not just a single market.

REFERENCES

Black, F. "The Pricing of Commodity Contracts." *Journal of Financial Economics* 3(1976):167-179.

Black, F. and M. Scholes. "The Pricing of Options and Corporate Liabilities." *Journal of Political Science* 81(May-June 1973):637-659.

Brorsen, B.W. and Nielsen, R.J. "Liquidity Costs in the Corn Futures Market." Selected paper at the American Agricultural Economics Association meetings, Reno, Nevada, 1986.

Fama, E. "Efficient Capital Markets: A Review of Theory and Empirical Work." *Journal of Finance* 25(1970):1043-1053.

Fama, E. "Efficient Capital Markets: II." *Journal of Finance* 46(1991):1575-1617.

Gallinger, G.W. and J.B. Poe. *Essentials of Finance: An Integrated Approach.* Prentice-Hall, Inc.: 1995.

Irwin, S., R. Leeds, and C. Zulauf. "The Use of Selective Storage Hedging to Increase Income of Ohio Farmers." Ohio State University, Department of Agricultural Economics. February 25, 1991.

Hartzmark, M.L. "Returns to Individual Traders of Futures: Aggregate Results." *Journal of Political Economy* 95(1987):1292-1306.

Johnson, R., C.R. Zulauf, S.H. Irwin, and M.E. Gerlow. "The Soybean Complex Spread: An Examination of Market Efficiency from the Viewpoint of a Production Process." *Journal of Futures Markets* 11(1991):25-37.

Luckac, L.P. and B.W. Brorsen. "A Comprehensive Test of Futures Market Disequilibrium." *Financial Review* 25(1990):593-622.

Luckac, L.P. , Brorsen, B.W., and Irwin, S.H. "A Test of Futures Market Disequilibrium Using Twelve Different Technical Trading Systems." *Applied Economics* 20(1988):623-639.

Thompson, S.R. and Waller, M.L. "The Execution Cost of Trading In Commodity Markets." *Food Research Institute Studies* 10(1987):141-163.

Working, H. "Futures Trading and Hedging." *American Economic Review* 43(1953):314-343.

Table 1. Mean and Standard Deviation (Risk) of Spring and Harvest November Soybean and December Corn Futures, 1974 - 1995

Performance Measure	November Soybean Futures		December Corn Futures	
	May 1	November 1	May 1	December 1
	cents/bushel			
Mean	633.5	630.5	262.9	258.6
Standard Deviation	83.7*	115.0	38.0*	54.7

* indicates statistical significance at 90% confidence level

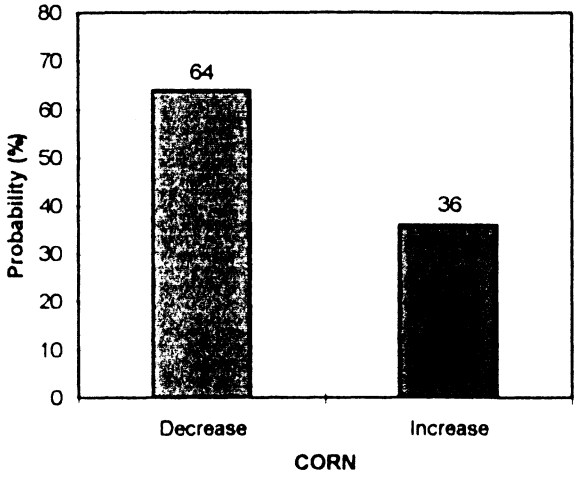
Table 2. Mean and Standard Deviation (Risk) of Spring and Harvest Selling Using Put Options, 1985-1995 for Corn and 1986-1995 for Soybeans

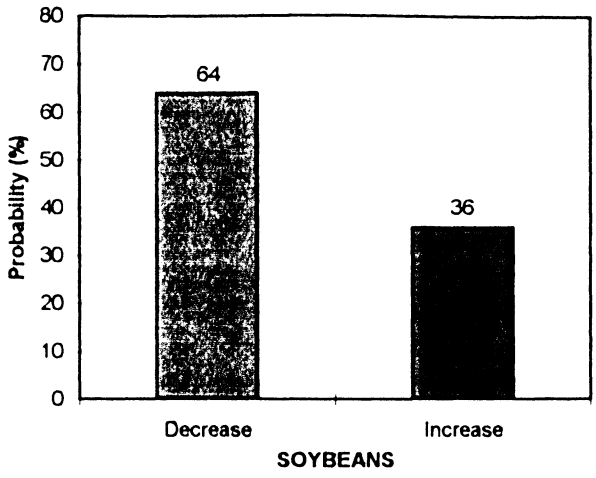
Performance Measure	Soybeans		Corn		
	Nov. Futures + Sept. Put	Nov. Futures Only	Dec. Futures + Sept. Put	Dec. Futures + Dec. Put	Dec. Futures Only
	cents/bushel				
	1985-1995				
Mean	605.9	593.0	246.3*	240.9	236.8
Standard Deviation	62.6	82.0	32.0	35.3	43.9
	1990-1995				
Mean	599.4	593.3	256.4	256.6	251.4
Standard Deviation	31.7	51.9	32.5	29.6	46.4

*indicates statistical significance at the 90% confidence level

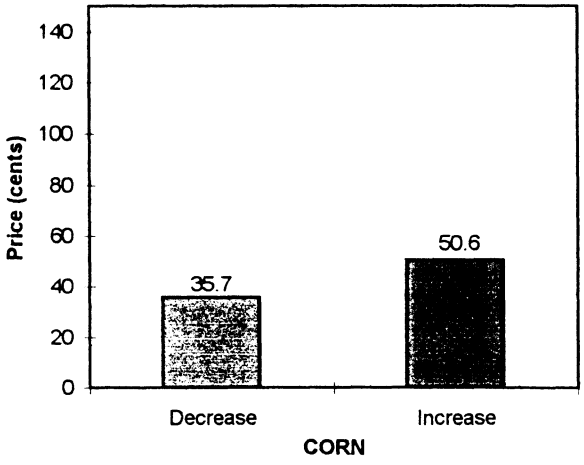
Note: Data for the November put on soybeans could not be obtained from the *Wall Street Journal* for May 1 observation date.

Observed Probability of a Price Increase and Decline Between May 1 and November 1 on November Soybean Contract and May 1 and December 1 on December Corn Contract, 1974-95





Average Price Increase and Average Price Decline Between May 1 and November 1 on November Soybean Contract and May 1 and December 1 on December Corn Contract, 1974-95



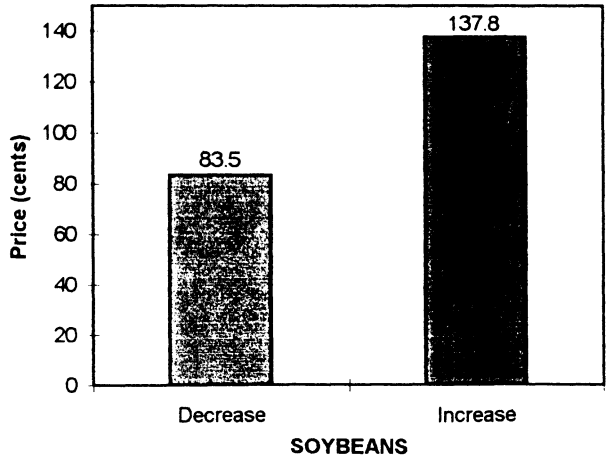


Table 3. HARTZMARK, 1977-1981

	Profits or Losses (million $)		
	LARGE HEDGER	LARGE SPEC	SMALL TRADER
Oats	9.63	0.64	-10.28
Wheat (CBT)	42.94	16.19	-59.14
Pork Bellies	79.05	1.48	-80.56
Live Cattle	-130.27	197.12	-66.85
Feeder Cattle	29.13	75.42	-104.55
T-Bonds	559.09	-169.07	-390.02
T-Bills	114.96	5.48	-120.44
TOTAL	728.00	125.00	-853.00

FIGURE 3. PREDICTABLITY OF RETURNS TO FLAT STORAGE USING JULY HARVEST BASIS CORN, OHIO, 1964-89

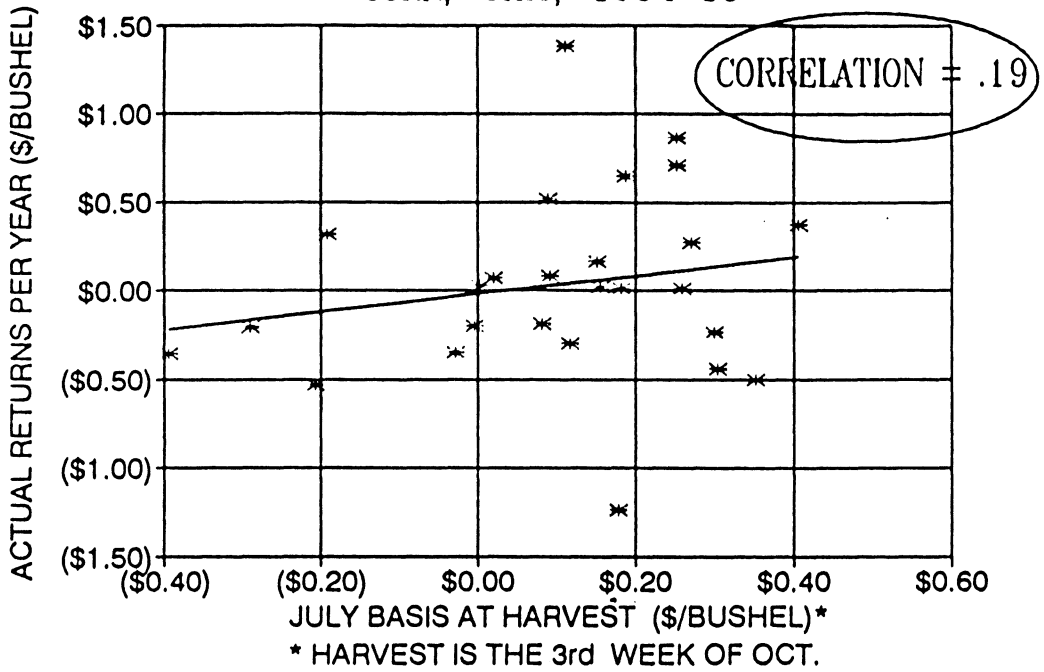


FIGURE 4. PREDICTABLITY OF RETURNS TO HEDGED STORAGE USING JULY HARVEST BASIS CORN, OHIO, 1964-89